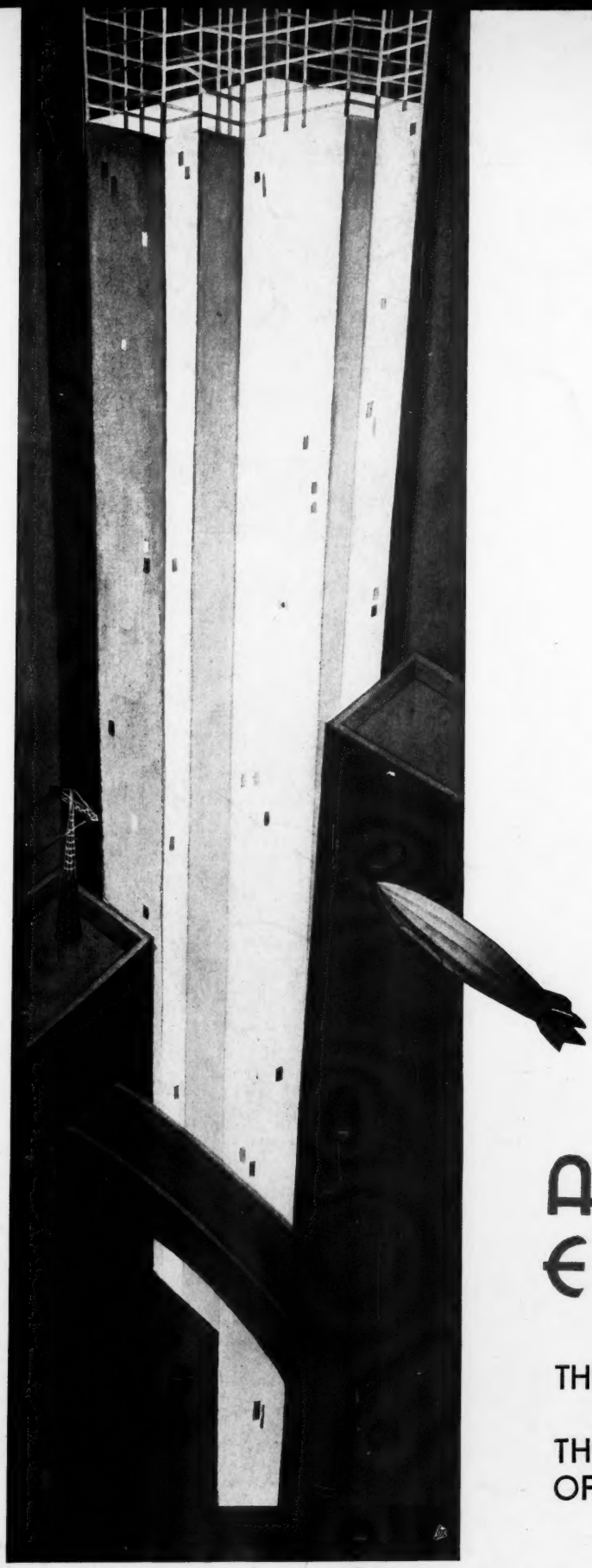
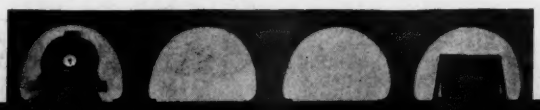


# *The* AMERICAN ENGINEER

OFFICIAL PUBLICATION
THE NEW YORK STATE SOCIETY
AND
THE NEW JERSEY ASSOCIATION
OF PROFESSIONAL ENGINEERS

NOVEMBER + + 1932



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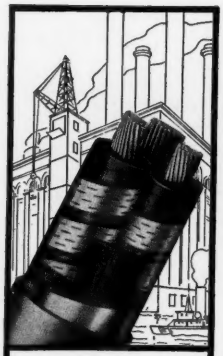

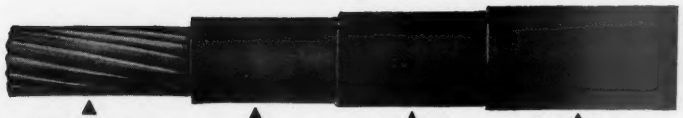


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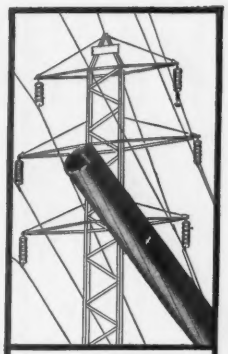

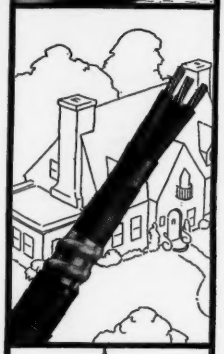

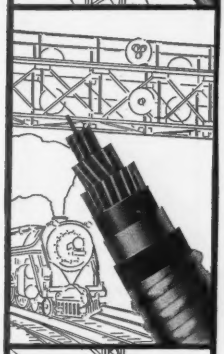

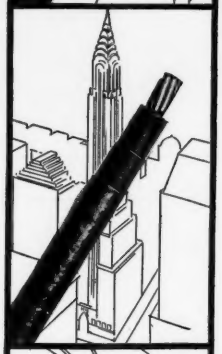

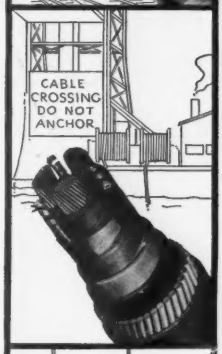


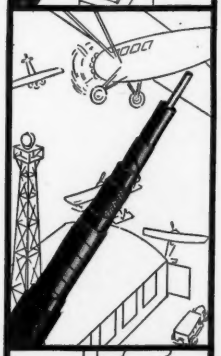

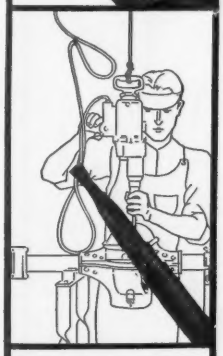

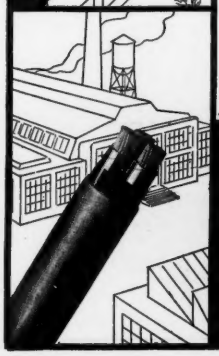

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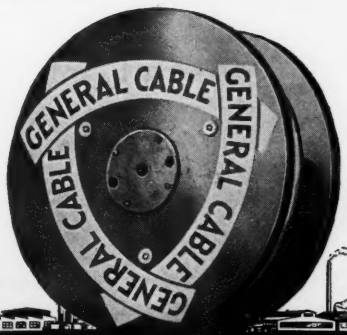


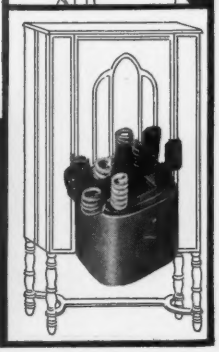

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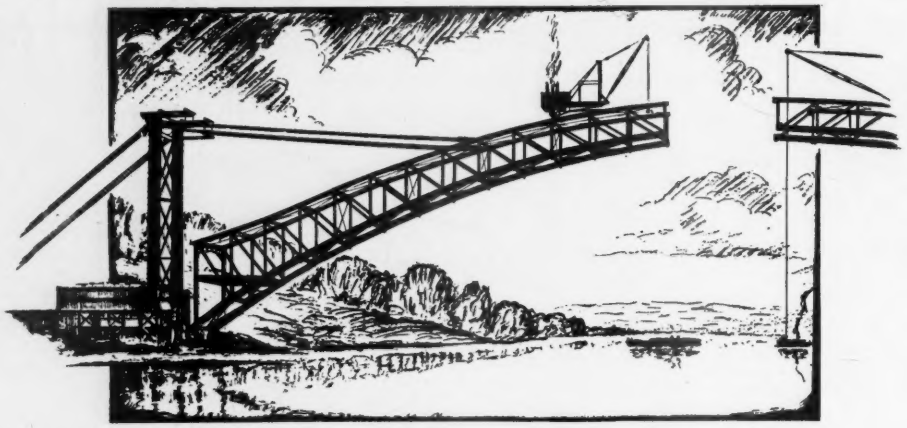

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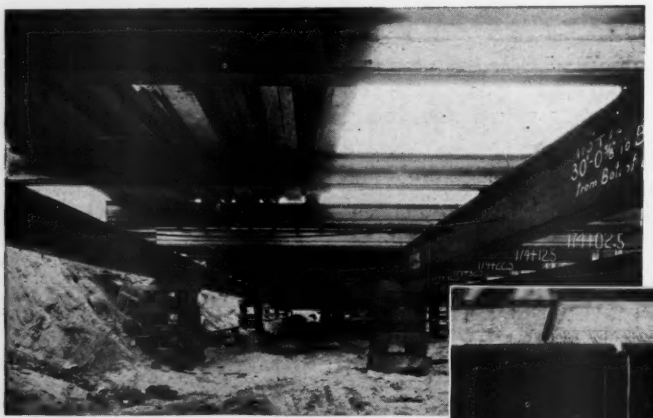

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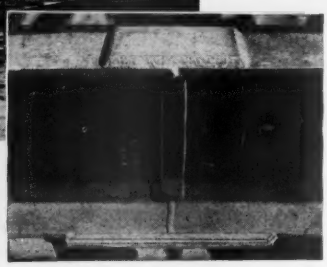

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OF

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# THE AMERICAN ENGINEER

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NUMBER 11 NOVEMBER, 1932

# EDITORIAL POLICIES

## Economic and Social Problems Concern Engineers

THE frequent appearance, in THE AMERICAN ENGINEER, of articles relevant to economic and social problems may, perhaps, warrant comment. To date, only commendation has come to the attention of the Editor but, in order to answer any doubts as to the propriety of publishing such material, attention is directed to the aims of the New York State Society of Professional Engineers under whose direction the magazine is issued.

From its inception the latter has sought to bring to society, its need of, and place for, the engineer; and to the engineer, a realization of his duty to, and place in, society. The civilization of the moment is largely the result of the engineer's efforts. These efforts have in the past been directed by others. The time has arrived when others are no longer capable of directing an engineering civilization, and the creator must assume a leadership if society is to be preserved.

The state professional groups differ from other engineering organizations in that their primary objectives pertain to the professional, social and economic activities and problems of engineers, rather than to the scientific and technical phases of engineering practice. Likewise, THE AMERICAN ENGINEER differs from other engineering publications and, in presenting material relevant to the relations between engineers and society generally, seeks to bring the engineer to the attention of the public by encouraging interest in his duties and his opportunities in the social and economic structure of modern civilization. That the policy of THE AMERICAN ENGINEER is promotive of the objects set forth is evidenced by the ever increasing interest which the engineer is taking in the solution of the problems of the moment and by the need for defense against the unjustified attacks by industrialists, sociologists, economists and others who, unable to explain the failures of the machinery of modern society, seek to excuse themselves by accusing the engineer. To such it is perhaps sufficient to say "Qui s'excuse, s'accuse," but unfortunately the world has so long accepted the theories and endured the loquaciousness, of these self-styled experts that the engineer's silence has been mistaken for ignorance.

The last few years have witnessed a marked change in the interest manifested by engineers toward the humanities of life. Scarcely a day passes without a social program from an engineer reaching the public press. A review of these indicates a thoroughness and an understanding and appreciation of logic seldom encountered in the dissertations and pronouncements of financial and business captains who discuss intangibles as a school boy does the systems in various fields of athletic endeavor.

Unfortunately, not alone for the engineer, but for the society which he seeks to serve, the programs of the former must receive the approbation of those who have so long directed and exploited him. Unable or unwilling to appreciate constructive and truly logical proposals the directing influences give little heed and continue groping blindly for a harbor in which to seek refuge from the storms of a somewhat socially and economically disorganized society.

There is, however, almost daily evidence of an awakening, upon the part of the public generally to a realization of the engineer's value to society, with the result that articles by engineers and reflections upon engineering methods of procedure appear frequently in the press and in various publications. One such, of special interest, that has received considerable publicity, is that appearing in current issues of the Review of Reviews and World's Work. It is known as the McDonald Plan to Stabilize Business and is the proposal of Frederick H. McDonald, an engineer of Atlanta, Georgia, and a member of the American Engineering Council. The plan is novel and, if practicable, would insure the stability of large business, against sudden collapse. Other matter appearing in the press and in publications, and indicative of the increasing importance of the engineer as a directing force in human affairs, is reproduced elsewhere in this issue. It is upon the assumption that both the profession and society are being served that THE AMERICAN ENGINEER brings to the attention of its readers evidences of the changing thought concerning our social and economic existence. In doing so it fulfills its purposes as set forth in its initial issue of January, 1931, and asks for the continued support of its policies.

# THE MACHINE: SLAVE OR MONSTER?

## By Alberto Pirelli

THE Rotarian, official publication of Rotary International, a magazine devoted to the advancement of the ideal of service and its application to personal, business, community and international life, contains in its November issue the following ably written and interesting article. It is published herewith with the permission of the Rotarian to whom acknowledgements are made.

Here is the indictment:

Modern mechanical civilization, born in Europe and carried to an extreme in the United States, is making Man the slave of his own machines.

Man is losing his personality; he is becoming standardized in his mentality as well as in his dress and his habits; he becomes lost in the multitude, a mere pebble on the beach, round, polished, one like every other.

The doctrines derived from scientific materialism prevail. Appetites grow but aspirations perish. The people know the price but not the value of things.

We cannot conceive the Saint, the Hero, the Poet, or the Artist seated before the calculating machine.

The outer life is killing the inner. Religious and family feeling are on the decline; Man no longer knows the divine joys of solitude, silence, contemplation—pursued as he is by the telephone, the phonograph, the radio, the clamor and uproar of the streets; his culture is based on the newspaper, the movies, jazz.

Vulcan has killed Apollo.

In answer to this indictment I think, it is not difficult to put up a very good case in defense of modern civilization. I also think that in so doing we soon reach a point in the argument when we must admit the dangers inherent in the predominance of the material over the spiritual, when we must place our trust in those ever resurgent forces making for balance which Nature always holds in reserve.

A defence of technological civilization must first of all put on record the wonderful improvement in the standard of living of vast masses of people in the most advanced countries of the world. They have been raised by it to conditions of life comparable to those of the few of barely a hundred years ago.

Three things, which seemed to be contradictory to one another, have materialized or are on the way of becoming a reality through economic progress: reduction in work hours, higher wage schedules, and lower costs.

As has rightly been said, machinery is labor-serving, not labor-saving; it has reduced physical fatigue, replacing men by mechanical devices for production and transport in the heavier and more repetitive tasks.

The ancients said that it took five slaves to make a free man. Today machinery has taken the place of the slaves, but not of the free man. True, a machine momentarily takes the work off the hands of the worker, but, in normal times, he can easily find other jobs which are made possible through the increased wealth brought about by the technological reduction of costs.

How is it possible to deny that the higher standard of life of the masses thus secured, together with the development by public and private enterprise of institutions for improving the education and health of the people, are not in themselves a splendid achievement?

Man will always have unsatisfied desires, but just think what it would mean if poverty, which in past times has been the rule, the destiny of the man, and is so in many countries even to this day, should become the exception.

Some speak with contempt of the levelling process, but if the levelling be upwards, let us bless it! In this case to convert the exception into the rule is surely progress. If the spiritual East is to be represented by the coolie-running rickshaw, then give me the materialistic West, with the motor-car at the disposal of the American worker.

Undoubtedly technological progress has been achieved through standardization and uniformity. I do not fear the standardization of articles of current use, provided it does not lead to standardization of thought and mental habits.

Nor need we fear that taste will deteriorate because the range of objects subject to standardization has enlarged; this is merely due to the fact that the number of objects in common use has grown. Taste and originality may be worked out in the widening fields of newly created classes of goods.

Standardization and mechanization of production have not only cheapened goods but have improved their accuracy and, generally speaking, their quality. If some people think the contrary is the case it is because they confuse quality with originality.

Present-day life is often accused of monotony in habits, but one of America's leading industrialists has rightly objected that "the great monotony is found in poverty. No mechanical operation can be devised which can equal in blankness the leaden dullness of continuous poverty. The one way to emancipate the people from a materialistic state of mind is to give them plentiful material possessions, for materialism grows from lack not from supply."

Engineering has provided means of transport and communication which have enlarged Man's horizon and opened the world up to masses of people to whom it was formerly a closed book.

Other ages have attained pinnacles of glory in philosophy or the fine arts, but surely the intellectual effort of the scientists of our own day is full

(Continued on Page 14)

# GERMAN ENGINEERS ASK RECOGNITION

## To Play Role in Regeneration of Nation

AT a recent Congress of the Society of German Engineers, attended by 1,200 members, a resolution demanding that engineers be accorded increased recognition in shaping the economic reconstruction of Germany, was enthusiastically adopted.

The press reports indicate that the attempts, of American politicians and American financiers, to discredit the engineer by attributing to him the economic misfortunes of the moment, have their counterpart in Europe. The collapse of the 19th century political economy is bringing with it the recriminations and accusations of those whose pedantic parade of their unproven, yet positive, opinons concerning sociology and economics now holds up to themselves the mirror of their own scorn of untested or unorthodox theories.

The following excerpts from the resolution are, in the light of conditions in this country, especially interesting:

"From the researches of economists no comprehensive understanding of economic events can be gained. It is all the more needful then that the engineer's insight, won from constant inexorable reality, should be made use of more than has been customary.

"Above all, it is necessary to guard against those irresponsible prophets who are talking the German people into a mood hostile to technology. The distress of these times could not be overcome at all if people turned their backs on technology.

"This society is imbued with a sense of patriotic duty to take the most active share in the German people's struggle to reconstitute its existence."

In Germany, as in America, the engineer is awakening to the fact that his duty to society is not satisfied by merely contributing to the material wealth and convenience of mankind and that his lack of interest in workings of the machinery of organized humanity is largely responsible for the unhappy conditions from which the world at present suffers. That he is arousing himself can be attributed primarily to the fact that, perhaps more than any other, he is reaping the reward of his indifference.

It is encouraging to note that engineers generally are giving themselves to a serious consideration of sociological problems. There is none foolish enough to believe that they can cure all the ills from which society suffers. Perhaps they will fail worse than those who have been the guiding influences during the past century. However, the engineer and scientist, are not so likely to become lost in a maze of ramification as have been the so-called economist and sociologist. The justification for such a statement lies in the procedure followed by the scientific mind. Every step of reasoning must be verified by methods which demonstrate beyond all doubt that the process to the point in question is unqualifiedly correct. Critics may reply that scientific tests cannot be applied to human problems. This undoubtedly is true but such a contention is beside the point, for critics here confuse the methods with the objective in mind. The great value of the engineering mind is that it takes nothing for granted and unhesitatingly rejects theories that cannot be satisfactorily demonstrated. One might contend, that with such exactions nothing would ever be accomplished, that the humanities of life cannot be measured or analyzed as are the physical things of the universe, and that the scientific mind would reject everything that pertains to the humanities of life. Here again the critic errs. The object of employing exacting methods is to prevent unstable or unproven premises from being expanded into doctrines. The absolutely unwarranted practice of terming as science theories that pertain to the humanities or that deal with social problems is detrimental to society. The engineer and scientist are primarily experimentalists and civilization would be in no danger of stagnation because of what the critic likes to term the narrowness or single track minds of such men. But society would not be so prone to forget that its methods and practices are, after all, those of human beings and that the imperfections of any system or order cannot be eliminated by expanding or developing theories which include these imperfections.

The ability of the non-scientific mind to analyze is not questioned, but the tendency in developing abstract ideas is to pass over questionable or weak links in the chain of thought. Unproven premises are frequently assumed for the sake of argument, investigation or research. Oft times the results indicate the justification of this procedure. It is by such methods that knowledge is increased, but all too often the non-scientific mind accepts results without requiring the universal and unquestionable proofs which the scientists insist upon.

The baneful influence of miscalled science is the principal cause of many of the problems that have come to society. Psychology, sociology and political economy have their place in human affairs but they do not belong in the category of knowledge upon which all men agree. The principles of mathematics, physics and chemistry are accepted by all mankind and can be demonstrated by any competent person, but there are as many theories concerning psychology as there are individuals and no man has yet demonstrated that there exists a single law, intelligible to mortals.

Only the man capable of appreciating that the yardstick of physical nature cannot be applied to human emotions is equipped to contend with the problems of modern civilization. Perhaps the engineer will prove himself equal to the task. Again, he may not.

INGENIEUR.

# ECONOMIC REGULATION

## An Engineer's Suggestion

THE World-Telegram of recent date carried the following proposal by Louis J. Newman, of New Rochelle, which is indicative of the ever growing interest of the engineer in a field for which he is especially well equipped:

"Recently there has been considerable discussion as to means of solving the problem of economic upheavals which occur from time to time and through one of which we are now passing. It seems to me that the whole situation should be considered from an engineering point of view and that the scientific methods which are applied in engineering could very well be followed in the treatment of economic matters.

The reason why periods of prosperity of unusual proportion are followed by periods of severe stagnation of business is due to what in engineering is known as "poor regulation." This is a technical phrase used in power operations to signify an unsatisfactory control of machinery for the delivery or consumption of power.

In the operation of our economic machinery there is a natural control by what is known as the law of supply and demand. After watching its operation for a considerable period we have come to the conclusion that this law of supply and demand functions with "poor regulation" largely because of the lack of proper co-ordination between producer and consumer. Therefore, the means of improving the regulation of business cycles lies in the establishment of better control of the law of supply and demand than results in the present method of letting it take its natural course.

In engineering operations we do not let things take their natural course, but by proper methods we are able to control gigantic forces which, if not properly regulated, would be extremely dangerous and very destructive in their effects.

The analogy of the regulation in the production of electric power will serve as an example of how regulation is achieved. Electrical energy is obtained from the conversion of mechanical power produced principally from steam. The demand for power varies with the seasons, with the time of day and even from instant to instant, and yet the control of the production is such that no matter how variable the demand is each component part making up the system, from the delivery of the fuel, the operation of the boilers, the distribution of steam, the regulation of generating units to the distribution of power, must be co-ordinated to function properly.

Without the proper regulating devices what havoc could be produced if the forces of the operation are unrestrained! Imagine what would happen if the fireman kept shovelling coal into the boilers when the demand for power dropped off and there was no instruments and safety devices to control the piling up of surplus energy production with this curtailment of power consumption!

The regulation of the generating unit in a power plant is a good example of how engineering has applied science to maintain the production of power within the limits of demand. The electric generator is coupled to the engine. The power required to operate the engine is steam, and the amount of steam consumed by the engine has a definite relation to the demand of electrical energy. Without any regulating device a reduction in demand would cause the engine to speed up to a dangerous degree, and, conversely, an increase in demand would cause loss in speed and possibly stoppage altogether. The result would be fluctuations which would seriously inconvenience the consumer. This tendency of change in speed is used for its control by the installation of a "governor," which gives the engine more steam with a slight increase in speed and reduces the steam supply with a slight reduction in speed. The regulation in a modern power plant is so closely maintained that the speed of the generating unit is used to give time by means of the electric clock.

Now, how will we regulate the economic forces so as to prevent the wide fluctuations between prosperity and depression? The only way is by regulation of supply to demand. Unfortunately, the producers are also consumers, and therefore any curtailment in production of goods causes a diminishing demand due to loss of jobs by the consuming public. If the consuming public would put aside a part of its income as an insurance against loss of employment the cycle of changes from prosperity to depression would vary in proportion to the amount laid aside.

From experience we know that the great consuming public cannot be made voluntarily to build up a reservoir to draw on during periods of stress. Therefore, does it not seem reasonable that such a fund be raised by an agency which represents all of us? Such an agency is government—local, State and federal. Economic regulation should be placed in government, as far as possible allowing it to store up a surplus during good times and then giving back this surplus during bad times. How good this regulation can be would depend on how good the government is, and this brings the matter back to the fact that it is up to the people to make the government good.

One of the means of regulation or, what can be called a "governor" of our economic forces, is taxes. When business is flourishing taxes should be high—the more income the higher the taxes. This money collected should not all be spent, but a portion set aside to pay off the public debt. When business declines taxation should decline, and if a state is reached where the budget is not balanced government may borrow again. During times of stress balancing the budget is an economic fallacy. If conditions warrant government may give back to the citizen part of the taxes

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# WHAT IS TECHNOCRACY?

## By Wayne W. Parrish

(Printed with Permission of the New Outlook)

THE November issue of the New Outlook, contains, under the above caption, a forceful exposition of the inadequacy of at least one phase of the 19th century political economy, and sets forth what many have realized for a long time, viz.: that the civilization of the times cannot be maintained without the directing influence of the engineer who has created it.

THE AMERICAN ENGINEER acknowledges the courtesy which has been extended by the New Outlook and advises that the December and later numbers of that publication will contain additional discussions upon the subject by Mr. Parrish.

"Today our engineers report:

The United States is much nearer a complete industrial collapse, as a result of the events of the last three years, than the vast majority of its citizens realize. Our entrepreneurs and political leaders have believed so steadfastly and for so long that America is incapable of anything except a continuous onward rush to prosperity and ever-expanding development that they have been either blind to, or unaware of, the vast technological forces which have been steadily undermining, particularly in the past two decades, our present haphazard industrial system of uncontrolled production, competition and distribution. In order to understand this viewpoint of Technocracy and to approach the method of reasoning of its members who see modern machinery carrying our social mechanism at an ever increasing pace it is necessary to review briefly the tremendous increase in speed which is characteristic of modern production. As we view these facts we cannot fail to note that as the machine improves we come nearer and nearer to the elimination of all human employment.

The ancient miller of Athens or Rome ground out in a day, between his two crude milling stones, a barrel to a barrel and a half of indifferent flour. A modern flour mill in Minneapolis produces 30,000 barrels a day per man with a much shorter day and a much better flour. But for whom?

A shoemaker of ancient Rome took five and a half days to make a pair of shoes. The 7,200 shoemakers in the Shoemakers Guild of Roman days would make only 7,200 pairs of shoes in five and a half days. The same number of employees in a modern shoe plant in five and a half days would produce 595,000 pairs of shoes. But for whom?

The brick-makers for over five thousand years never attained on the average of more than 450 bricks a day per man—a day being over ten hours. A modern straightline continuous brick plant will produce 400,000 bricks a day per man.

Even a century ago in these United States one man produced 25 tons of pig iron each year while it took another man a year to produce 800 tons of iron ore. In 1929 we mined on the Mesabi Range at the rate of 20,000 tons per man per year and in four weeks moved a greater tonnage than that of the Khufu Pyramid at Gizeh, while our modern blast furnace technique has made it possible for one man today to produce 4,000 tons of pig iron per annum.

A photograph of a modern steel rolling mill in full operation will show a large plant without a human being on the floor.

It is after sober, scientific review of such facts that our engineers report that we are faced with the threat of national bankruptcy and perhaps general chaos within eighteen months. This threat is revealed as a result of the researches of Technocracy, a functional organization of engineers which has been studying our industrial and agricultural complex for more than a decade. The results of that study and analysis, which for the first time in human history applies a quantitative measure to the social mechanism, leads to an unqualified statement that there is no solution under a price system.

Our civilization is extremely dependent on the smooth functioning of our high speed mechanism. If the flow of physical energy ceased (no coal, no oil, no water power) our civilization would collapse and we would starve to death in twenty days or thereabouts. At least ninety per cent of the nation's population would be rendered helpless. What would happen in a typical town of 10,000 persons in the United States is easy enough to imagine. The average town could burn in seven hours without a water supply; transportation and communications would be completely disrupted; sewage systems would break down, and the supply of meats and other foods would be gone within a week. New York would be on fire within three hours without a water supply. It has fresh vegetables on hand for forty-eight hours and other food for a few days longer. Traffic jams would make movement of people impossible. Disease would be rampant with no means of treatment.

Obviously, anything so important to our existence should be operated with the greatest care. But we have been attempting to operate the delicate controls of a high-powered energy civilization with methods that were crude enough in the ox-cart days when almost every home was self-sufficient and independent. Twenty per cent of our population is already made helpless by unemployment. How much farther in our decline (and our decline has not once halted since 1929) will we have to go before our machine begins to fall to pieces? This is the question which Technocracy poses for us.

What is Technocracy? At present, it is a group of engineers engaged in the most extensive analysis of our industrial and agricultural growth ever

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# EXAMINATION QUESTIONS

## For License as Professional Engineers

In answer to many requests concerning the knowledge required of candidates seeking to practice professional engineering, the questions of the Examinations held in June, 1932, are printed herewith:

### Part I
### MATHEMATICS

**Monday**, June 27, 1932—9:15 a. m. to 12:15 p. m. only

*Answer any eight of the following questions. Slide rule and any reference books may be used. Return these questions with your answer papers.*

1 Find $x$ if $3^{x}+^{3} = 405$

2 When $x$ is so small that its square and higher powers may be neglected, find the value of

$$\frac{\left\{1 + \frac{2x}{3}\right\}^{-5} + \sqrt{4+2x}}{\sqrt{(4+x)^3}}$$

3 The population of a city increased from 125,000 to 305,000 in 7 years. Assuming that the rate of increase was constant per year, find the annual rate of increase.

4 A cork sphere has a radius of 2 feet and a specific gravity of 0.18; find how deep it will sink in water, if the depth $d$, radius $r$ and specific gravity $s$ are connected by the relation

$$d^3 - 3rd^2 + 4r^3s = 0$$

5 In a circle of radius 5 feet, find the area of the smaller segment formed by a line whose distance from the center is 3 feet.

6 On a railway curve which is the arc of a circle, two points $P$ and $Q$ are taken and the chord $PQ$ is found to be 400 feet. The distance from the mid-point of the arc to the mid-point of the chord is 288 feet. Find the radius of the circle.

7 In a triangle $ABC$, *the* side $BC$ is 167.01 feet, the side $AB$ is 82.315 feet and the angle $B$ is 98° 14′. Compute the side $AC$ and the angle $A$.

8 A man owns a triangular lot on the corner of two streets which intersect at any angle of 62°. The frontage on one street is 200 feet, on the other 150 feet. If the land is worth $1 a square foot and the man has $1200 with which to increase the size of his lot, by how much can he lengthen the 150-foot frontage?

9 A parabolic arch has a span of 40 feet and is 10 feet high. Find the width of the arch 5 feet vertically below the top of the arch.

10 Find the equation of the locus of the point which moves so that the difference of its distances from two points (6, 0) and (—6, 0) is equal to 8.

11 The United States Parcel Post service accepts for transportation parcels for which the sum of the length and girth (distance around the middle) does not exceed 100 inches. Find the dimensions of the box of greatest volume that will satisfy this condition, if the box is to have square ends.

12 A roofer wishes to make an open trapezoidal gutter of maximum capacity whose bottom and sides are each 4 inches wide and whose sides have the same slope. What should be the width across the top?

### Part I
### APPLIED SCIENCES

**Monday**, June 27, 1932—1:15 to 4:15 p. m., only

*Answer any eight of the following questions. Slide rule and any reference books may be used. Return these questions with your answer paper.*

1 A trolley car accelerates at 2 miles per hour per second for 15 seconds, then it coasts for an equal period, losing velocity on account of friction at the rate of 1/3 mile per hour per second, and finally the brakes are applied to bring the car to rest in 5 seconds. How far did the car travel during the 35-second run?

2 A stream of water issues horizontally from an orifice with a velocity of 40 feet per second. How far below the elevation of the orifice will the center of the jet be when it is 12 feet from the orifice horizontally? Neglect frictional resistances.

3 A gun, which has a barrel 45 feet long and an area of bore 80 in.$^2$, throws a shell weighing 800 pounds. The pressure caused by the detonation varies from 50,000 pounds per square inch at the instant of detonation to 5000 pounds per square inch as the projectile leaves the muzzle. Assume the variation of pressure as uniform with respect to the displacement of the projectile and neglect the effect of friction and recoil; then determine the muzzle velocity by the principle of work and energy.

4 Find the cost of fuel for a locomotive for each ton of freight that it hauls 1000 miles, assuming that the average pull per ton of the load is 18 pounds, that the train weighs as much as the load and that the locomotive develops 1 h.p.-hr. from each 4 pounds of coal. The coal costs $4 per ton.

5 A pump raises fresh water from a source and delivers it to a point 50 feet above the source at the rate of 5.0 cubic feet per second. Frictional resistances in the piping amount to 10 feet of water. The motor driving the pumps consumes energy at the rate of 50 horse power. What is the efficiency of the motor-pump combination?

6 A ladder having the shape of an A-frame consists of two members 18 feet long and a tie-rod 5 feet long connecting the members at points 12 feet from the hinged apex. Neglecting the weight of the ladder and assuming that the ladder rests on a smooth surface, ascertain the tension in the tie-rod when a load of 200 pounds is placed at the apex of the ladder.

7 *a* It is desired to store 1 kilogram of helium in a tank at 20° C. and 5 atmospheres pressure. The density of helium at 0°C. and 1 atmosphere is 0.18 grams per liter. What capacity tank in liters is required?

*b* If the helium is at 45°C. when originally stored in the tank, how many liters of helium measured at one atmosphere pressure are required to meet the requirements in Part *a*?

8 To find the temperature of a certain furnace, a piece of platinum of mass 10 grams is placed in it. After taking the temperature of the furnace it is suddenly plunged into 40 grams of water at 10°C. The temperature of the water rises to 24°C. What is the temperature of the furnace, if the specific heat of platinum is assumed to be 0.032?

9 How many pounds of steam at 212° F. must pass into the water in a swimming tank to heat it from 60° to 83° F.? The tank is 50 feet x 100 feet and the depth varies uniformly from 4 feet at one end to 10 feet at the other.

10 How many cubic feet of carbon dioxide should result from the complete combustion of one ton of coke which contains 85% fixed carbon and no volatile matter?

11 One locality has 20 inches of annual rainfall, mainly in the summer; another locality has 30 inches annually, rather evenly distributed throughout the year. Which makes more trouble for the engineer? How and why?

12 *a* Write formulas for the following substances:
Zinc phosphate, hypochlorous acid, ferrous sulphate, potassium nitrate, ammonium chloride, lead bromide, aluminum chloride, ozone, calcium hydroxide, hydrogen peroxide.

*b* Write equations for the following reactions:
setting of plaster of Paris
calcium carbonate + water + carbon dioxide
potassium chromate + sulphuric acid

13 *a* A compound was found on analysis to have the following percentage composition: sodium 32.43%, sulphur 22.55%, oxygen 45.02%. What is the formula of the compound?

*b* Compute the weight of one cubic foot of the following gases under standard conditions: nitrogen, steam or water vapor, chlorine. [Atomic weights: O = 16, N = 14, H = 1, Cl = 35.5]

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# PROFESSIONAL INCOMES

## Medicine Rated Highest

The Columbia Alumni News of October 14th, 1932, carries the appended interesting article prepared by Harold F. Clark of the teaching staff of that institution:

### MEDICINE MOST LUCRATIVE PROFESSION

It is a long and difficult path that medical students must follow in the study of their profession, but at the end there lies a pot of gold. After three years of research extending through practically every profession and every trade, Harold F. Clark, '22AM, '24PhD, Professor of Education at Teachers College, has compiled an extensive array of statistics that reveal the doctors as the one group of professional men that earns more money in a lifetime than any other group.

The final figures are all averages, computed from the lifetime earnings of the specialists in large cities and the rural doctors who still harness up old Dobbin or crank the antiquated Ford to go on their calls. The same holds true of the lawyers and engineers, whose earnings in large cities are averaged with those in small towns.

Figuring the average working lifetime of professional men as between 40 and 45 years, Dr. Clark has reached the figure of $117,000 as the present value of the average lifetime earnings of doctors and the same figure also holds true for lawyers. In the case of the doctors, however, it was found that a large percentage of them in the United States are not graduates of medical schools. It is this group that pulls down the average, because graduates of Columbia, Harvard and Johns Hopkins and other Grade A institutions have annual average incomes of far above $6,000, even when out of college for only a few years. A large percentage of lawyers did not attend law schools, it was revealed.

#### Medicine and Law Lead

The results of the research conducted by Dr. Clark are for the purpose of giving a rough relative picture of the approximate incomes in the different occupations. Medicine, law and engineering were found to be the professions with high average incomes.

The mean annual income in medicine is $5,250 and a similar figure was reached by law. The mean annual income in engineering is $5,000. The low average incomes were found to be in unskilled labor and in farming—$945 and $650 respectively. It was also found that the length of working life in professions is higher than in unskilled labor or in the skilled trades.

Dr. Clark was aided in his research by several professional and trade journals, insurance companies and by the United States Government. The figures for each profession are reached by examining the records of men who enter a profession and remain in it until they retire or die rather than by examining the incomes of men who stay in a profession for only a few years and then transfer to some other means of livelihood. The graduates of more than one hundred colleges and universities throughout the country were the subjects of the research.

The various professions are so different from each other in a number of ways, according to Dr. Clark, that it is practically impossible to present a comparative picture of them with figures alone. From an economic aspect the nearest that one can come to a statistical presentation is in a comparative table showing the average earnings for each level of experience in each field.

#### Status Varies

"Even if all the actual facts concerning the amount of income could be condensed into a set of figures the general interpretations would still require great caution in the making," Dr. Clark said.

"Although the present value of the life earnings summary may be a relative index of the amounts of money earned in each profession it must not be taken as an index to the economic status of the members of the different professions. Status is divided from station and station is always relative to something. The economic status is relative to economic conditions in a given community.

"For instance, a man living in New York City on $3,000 a year would occupy a relatively low economic position, while the recipient of the same income in a southern rural community would possess a high economic status. Now, when figures are brought together and estimates made for the entire United States, the resulting averages cease to bear much relevancy to economic and social position. This is well illustrated by the different geographical distribution of engineers and physicians. There is a very high concentration of engineers in large cities, coupled with almost a complete absence of them in rural districts. Physicians, on the other hand, are distributed more in accordance with the population. Therefore, the average for the earnings of physicians in the United States is based on many rural incomes while the average for the earnings of engineers is compiled almost entirely from urban incomes. To compare the averages would be to compare the incomes of country doctors with city engineers, which would not be a relative consideration of engineers with doctors.

#### Older Engineers Prospered

"Since the two averages are so nearly similar the implication is that city physicians make more money than city engineers and the economic status of the medical man is higher than that of the engineer in general—considered community by community."

The research conducted by Dr. Clark reveals that the earnings of engineers with twenty-five and thirty years' experience today are incomes of men who are occupying an unusual position. Thirty years ago engineering colleges had enrollments of about one-fiftieth the size of engineering colleges of today. Also graduates of thirty years ago began their life work at the time of an unparalleled expansion in technical development of the world. These graduates, numerically few and facing a great and growing demand for their talents, were in an unusually favorable position. The excessive numbers of young graduates entering the field today cannot expect to parallel the careers of these older men who profited by an exceptional combination of circumstances, in the opinion of Dr. Clark.

On the other hand, the young medical graduate may very likely earn considerably more income thirty years from now than the present medical man with thirty years' practice. There has been a consistent decrease in the number of medical colleges accompanied by an ever growing demand for medical treatment due to greater public health activities and greater general knowledge of health measures.

Dr. Clark pointed out that another field in which certain indications of changes are apparent is that of public school teaching. The salary schedules were devised for a system in which only a small percentage of workers reached the maximum rates, due to a very high turnover. With the increasing tendency for workers to remain for life in the field, the percentage of workers reaching the maximum rates is constantly growing and will very likely prove a tax burden. He used as an example the city of Pittsburgh, in which such a condition has occurred, and it has been found necessary to limit to a certain percentage the number of persons who may attain the maximum schedules.

In regard to journalism, Dr. Clark found that the majority of persons who were graduated from schools of journalism did not remain in their particular field because they branched off into advertising and publishing.

#### Summary of Life Earnings

| Occupations | Present Value of Average Life Earnings | Average Annual Earnings |
|---|---|---|
| Medicine ..... | $117,000 | $5,250 |
| Law ..... | 117,000 | 5,250 |
| Engineering (professional) | 108,000 | 5,000 |
| Architecture .... | 108,000 | 5,000 |
| Dentistry ..... | 108,000 | 4,725 |
| College Teaching | 74,000 | 3,260 |
| Social Work .... | 57,000 | 1,517 |
| Ministry ..... | 46,000 | 2,220 |
| Library Work .. | 44,000 | 2,200 |
| Journalism ..... | 43,000 | 2,250 |
| Skilled Trades . | 34,000 | 1,700 |
| Public School Teaching ..... | 30,000 | 1,360 |
| Nursing ..... | 28,000 | 1,570 |
| Unskilled Labor | 18,000 | 945 |
| Farming ..... | 14,000 | 600 |

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# GENERAL NEWS

## CAMPAIGN TO PROTECT THE TERM "ENGINEER"

### More Abuses Corrected

Two years ago, the New York State Society of Professional Engineers inaugurated a campaign, by correspondence and personal interviews, to stop the abuse or unauthorized use of the term "Engineer" or "Engineering." Some of the successful results achieved were described in brief reports in the April and May, 1931, issues of *The American Engineer*. This campaign is being continued, and typical illustrations of more recent accomplishments are here reported.

A local newspaper in upstate New York carried an advertisement featuring the designation "*Domestic Engineer*—Furnaces cleaned and repaired." Dr. Steinman wrote to the advertiser, explaining why the Engineering Profession objects to such designations and citing the law protecting the professional title. The offender replied in appreciative apology, promising that the designation "Engineer" would be omitted from future advertisements.

Another man used the designation "*Service Engineer*" on his advertising circular, listing such services as "Lawn mowing, gardening, porch screens removed, woman for house cleaning, chauffering, care of walks, magazine subscriptions." Charles W. Marvin, Chairman of the Legal Committee of Monroe County Chapter, had this man call for a personal interview, and advised him of the Professional Practice Law. The man agreed to use some term other than "Engineer" in his future advertising.

A corporation manufacturing outdoor games displayed the designation "*Amusement Engineers*" on its letterheads. A diplomatic letter of protest brought the reply: "We are having printed new letterheads and will immediately discontinue the use of the term to which you object."

Another manufacturing corporation used the designation "*Fence Engineers*" on its stationery. Arnold G. Chapman, Chairman of the Legal Committee of the State Society, addressed a courteous request for correction. The president of the corporation replied that they had used the imprint through ignorance of the recently enacted State Laws, and that they will discontinue the use of the objectionable words in future stationery and sales programs.

A coal company used the term "*Heating Engineers*" in their advertising. Upon protest from Mr. Marvin, the company recorded in writing its agreement to change the designation to "Heating Experts" in all future advertising of their service department and service men.

A local dealer for a national radiator company displayed the sign "*Plumbing and Heating Engineer*" on his window. Following a letter of protest from Dr. Steinman, the sign was changed to "Plumbing and Heating Contractor."

In order to increase the effectiveness of this campaign, a program of public education through the newspapers is now being planned by the State Society.

* * *

## ANNUAL REPORT OF THE NEW YORK STATE BOARD ENGINEERING EXAMINERS

### By Roy G. Finch, Secretary of the Board

During the year August 1, 1931—June 30, 1932 the State Board of Examiners for Professional Engineers and Land Surveyors held 11 meetings and considered 1103 applications for licenses, of which 341 were rejected, 152 held for further examination, 107 held for further consideration, and 503 recommended for licenses. It will be noted that 46 per cent of the applicants were recommended for licenses on the basis of the applications as originally submitted.

Written examinations were held in February and June. Seventy-eight applicants for licenses were notified to appear for the February examinations and of these 19 appeared. This examination resulted in the rejection of 11 applicants, the holding of 1 applicant for re-examination in one subject, and the recommendation that 7 applicants be granted licenses. Fifty applicants were notified to appear for the June examinations and 23 did appear. Thirteen of these were rejected, 7 held for re-examination in one subject, and 3 were recommended for licenses.

During the fiscal year July 1, 1931—June 30, 1932 the net amount received from fees amounted to $26,812.90 and the expenditures were $17,004.37, which left a balance of $9,808.53 which was paid into the State Treasury.

During the past year the Board, with the approval of the State Education Department, and acting in behalf of the National Council of State Boards of Engineering Examiners, has issued certificates of qualification to certain applicants who are licensed to practice professional engineering in the state for the purpose of facilitating the obtaining of registration or license to practice in other states. Twenty-one applications were received and national certificates of qualification were issued to 17 of these applicants, and in the remaining 4 cases the Board declined to issue such certificates.

In accordance with the provisions of Chapter 468 Laws of 1932, which became effective March 28, 1932, the Engineers Licensing Law was amended in many respects. In general the law was strengthened, the educational requirements raised, more definite provisions added for written examinations, and by this amendment, together with a somewhat similar amendment to the Architects Registration Law, the practices of engineering and architecture in this state have been placed more on a parity. The Engineers Examining Board desires to express its appreciation to all individuals and groups who aided in securing the legislation now in force and particularly to thank the officials of the State Education Department and the Board of Examiners and Registration of Architects for their helpful cooperation.

There has been no change during the past year in the personnel of the Board which is as follows: Albert H. Hooker, Chairman; David B. Steinman, Vice-Chairman; Roy G. Finch, Secretary; Virgil M. Palmer; Erich Hausmann.

* * *

## AMERICAN SOCIETY OF MECHANICAL ENGINEERS

### Annual Convention

The Annual Meeting of the Society will take place in New York on December 5, 6, 7 and 8th.

Working stresses, locomotives, heat, metal rolling, car design, metal cutting, handling materials, industrial power, mechanical springs, bearings, foundry practice, economics, hydraulics, dyeing, management, Diesel engines, aeronautics, central station power, lubrication and training for industries are amongst the topics to be presented at the Convention.

On Tuesday, Wednesday and Thursday Dr. S. Marion Tucker will lecture on "Talking with an Audience." The Annual Dinner will be held on Thursday, December 7th, at the Hotel Astor. All engineers are invited to participate in the discussions and to attend the banquet.

* * *

## ROBERT RIDGWAY RETIRES

### Chief Engineer of New York's Subway System

The New York Times of October 25th commented editorially upon the ability, devotion and integrity of a distinguished engineer and a truly great public servant. The editorial, which merits widespread publication, is as follows:

#### AN ENGINEER RETIRES

"While this city as long been troubled about its wasteful and dishonest government, the Chief Engineer of the Board of Transportation, Mr. Robert Ridgway, has been quietly and efficiently going about the business of designing and building subways that have been a model for the rest of the work and setting an example of devotion and integrity in public service. Unfortunately, the public wakes up to this only on the eve of his retirement after forty-eight years of duty, of which thirty-two were spent in solving the city's difficult transit problems. We saw streets torn up, car lines and sky-scrapers underpinned, enough dirt and rock excavated to form a new waterfront on the Hudson River, and the other day we rode for the first time in the subway that marked the culmination of all this ingenuity and

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# CHAPTER NEWS

## New York

### QUEENS COUNTY

The Queens County Chapter held its first meeting of the 1932-33 season on September 30th in the Medical Society Building at Forest Hills.

The Board of Directors at its meeting prior to the Chapter meeting approved of a paper entitled "A proposed civic center for Queens" to be read before the Chapter at its October meeting by George H. Bruns, a director of the Chapter.

A committee was appointed by J. Franklin Perrine, President of the Chapter, to formulate a schedule of fees for professional services for the observance of the surveyors of Queens County. The schedules adopted by Bronx, Richmond and Kings County Chapters will form the basis of the necessary studies which will comprehend special local conditions which may require special corresponding provisions.

The Chapter endorsed the action of the State Executive Board authorizing participation by the five Chapters within the confines of New York City in the work undertaken by the Citizens Budget Commission and authorized the payment of the Chapter's contribution toward the dues required for such participation.

The action of the State Executive Board in authorizing the payment of part of the dues of new members to Chapter members securing such new members was also endorsed. It is anticipated that this action will result in increasing the membership of the Chapter and will provide a source of revenue to members out of employment.

J. Franklin Perrine, President of the Queens county Chapter and Chief Engineer of the Bureau of Sewers in the Borough of Queens, was honored by 500 associates, friends and neighbors at a dinner, celebrating his twenty-five years of admirably efficient service to the City of New York, which was held at the Elks' Clubhouse, Elmhurst, on October 27th. Among the distinguished representatives of the public, professional and civic life of the City and County who gathered to pay tribute to the guest of honor were: Hon. Thomas C. Kadien, Jr., County Judge, Queens County; Hon. George U. Harvey, Borough President of Queens; Hon. John J. Halleran, Commissioner of Public Works, Queens; Hon. Bernard M. Patten, Commissioner of Taxes and Assessments, Queens; Rev. William J. Hamilton; Hon. William F. Brunner, Congressman, Queens County; Hon. George J. Ryan, President, Board of Education; Dr. John H. Barry, Assistant Sanitary Superintendent, Department of Health; Major Oscar Erlandsen, Consulting Engineer, Borough of Queens; Andrew K. Johnson, Chief Engineer of Highways, Borough of Queens; Arthur S. Tuttle, Consulting Engineer, Board of Estimate and Apportionment; Dr. D. B. Steinman, President, New York State Society of Professional Engineers; Arthur V. Sheridan, Past President, New York State Society of Professional Engineers; Jabez E. Dunningham, President, Queens County of Civic Associations; Henry T. Haarmeyer, President, Central Queens Allied Civic Associations.

Borough President Harvey, on behalf of the assembled celebrants, presented the guest of honor with a sterling silver coffee and tea service as a memento of the happy occasion.

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### GENESEE COUNTY

A cordial welcome is extended to the latest Chapter to join in the work undertaken by the State Society in fabricating a shield to protect the "life, health and property" of the people of the State of New York.

On October 14th a representative group of engineers of Genesee County met at the Elks Club at Batavia to organize a new Chapter. There were also present to give counsel of their experience in State Society matters Charles W. Marvin of the Rochester City Engineering Department and President of the Monroe County Chapter; Francis X. Bode, District Supervisor of Building Construction for the North Eastern District of the New York State Department of Public Works and Chairman of the Membership Committee of Albany County Chapter; and George Zimmerman, Associate Mechanical Construction Engineer in the North Eastern District of the New York State Department of Public Works and a member of Oneida County Chapter.

The work of arranging for the meeting and setting up a permanent organization was accomplished by a temporary committee composed of L. J. Honan, Chairman; LeRoy F. Clark, Vice-Chairman; and Charles W. Becker, Secretary.

The following permanent officers were elected: President, John C. Cowie of Caledonia; Vice-President, C. I. Hodgson; Secretary-Treasurer, A. O. West; Directors, L. J. Honan, V. L. Shepard, LeRoy Clark and W. H. Wilcox, the last six of Batavia.

The following engineers were also present: R. N. Greene, Charles W. Heydt, John Dunlop and F. Benson.

Best wishes are extended to this youngest of Chapters for long and useful participation in the work of the large and growing family of New York State Chapters.

Congratulations are also extended to L. J. Honan, LeRoy F. Clark and Charles W. Becker and to those stalwarts Charles W. Marvin, Francis X. Bode and George Zimmerman, whose combined efforts were responsible for the successful accomplishment of this organizing endeavor.

* * *

### ALBANY COUNTY

Albany County has again distinguished itself in the field of Chapter Organizing Activities. Distance does not discourage its advance. Vaulting over Warren and Saratoga Counties its missionaries penetrated into Essex County and on September 15th assisted in the ceremonies of raising the colors of the New York State Society in that county. And then taking flight almost completely across the State they preached the purposes, accomplishments, growth and influence of the State Society to the engineers of Genesee County. Their words fell on good ground and taking root sprang up and flourished. And the fruit of their labors is another new Chapter—Genesee County Chapter—for the moment, the youngest Chapter in the State.

Albany County Chapter is without a peer in the work of organizing new Chapters. Due to its organizing zeal and ability in less than one year the names of six new Chapters—Rensselaer, Schenectady, Columbia, Dutchess, Essex and Genesee—have been inscribed upon the roster of New York State Chapters and the work of the Society extended into territories covering 4,650 square miles, having a total population of 480,000 persons.

Edward E. Sheldon and Francis X. Bode, President and Chairman of the Speakers Committee, respectively, of Albany County Chapter, together with W. J. Picard, constitute the spearhead of the organization advance. They are indefatigable in promoting the physical growth of the Society and deserve the heartiest congratulations of all members both for the efforts they have made and the success they have achieved.

* * *

### ERIE COUNTY

Fletcher H. Burke, Secretary of Erie County Chapter, and Fred H. Zurmuhlen, Jr., Chairman of the Membership Committee of the State Society are vigorously engaged in an effort to organize the ninety (90) licensed engineers and surveyors of Niagara County. Mr. Burke is communicating with these engineers and his lively, stimulating correspondence can be counted upon to arouse that interest which will result in the formation of a new Chapter. May success crown his efforts.

* * *

### KINGS COUNTY

Roy C. Cram, the energetic Secretary of the Kings County Chapter, has recently communicated with the Brooklyn Bar Association, the County Clerk of Kings County ,and the Commissioner of Public Works and the Superintendent of Buildings of the Borough of Brooklyn, courteously calling their attention to the Engineers' License Law as amended by Chapter 468 of the Law of 1932 and requesting their co-operation, in so far as it lies within their power, in the enforcement of the law to the end that the incompetent and the quack be eliminated from the field of professional practice.

Mr. Cram reports that correspond-

ence with the Kings County Clerk indicates that only 20% of the new licentiates in Kings County have registered in that County since the amended License Law went into effect.

He also reports, with evident gratification, a recent case where an unlicensed self-styled "consulting engineer" relinquished that title upon receipt of certain representations from the Chapter and the State Education Department and now appears in the role of a "Light Saver"—some transformation.

The Chapter has responded to a number of requests from other Chapters for copies of its Code of Ethics and Practice and has received a number of calls for its Schedule of Fees for Land Surveying.

Charles W. Burke, President of the Chapter, is Chairman of the "Citizens Budget Commission Committee of the New York State Society" which, under his energetic leadership, promises to render valuable constructive service in that important civic undertaking.

Kings has one of the most progressive Chapters in the State—one which has a clear understanding of the purpose for which the State Society was organized to advance. The enthusiasm with which it is resuming its activities after the summer intermission is an earnest of the service it will render to the Society during the coming business year.

* * *

## NEW YORK COUNTY

Word has come from F. A. Rossell, Secretary of the New York County Chapter, that the Fall business meeting of the Chapter was held at Havemeyer Hall, Columbia University, on November 3rd at which time a program of activities for the season was adopted under the leadership of Prof. W. J. Krefeld, President of the Chapter.

New York County Chapter sent a goodly representation to the Annual Convention of the National Council of State Boards of Engineering Examiners which was recently held at the Hotel Pennsylvania, New York City, and participated in the presentation of the testimonial scroll to Dr. D. B. Steinman who is a member of that Chapter.

* * *

## WESTCHESTER COUNTY

On September 21st the Board of Directors of the Westchester County Chapter held a meeting with almost 100% of the Directors and Officers in attendance. At this meeting the action of the State Executive Board at its September meeting were endorsed in all matters which affected the Chapter.

The first regular Chapter meeting of the season was held in White Plains on October 20th and was attended by 45 members. The guest speaker at the meeting was Mr. Wayne D. Heydecker, Director of the Westchester County Emergency Work Bureau, who spoke on the present economic situation in Westchester County. The subject was one of unusual interest as the Chapter is actively engaged in assisting engineers who are in difficulties arising out of unemployment. That these activities have been remarkably effective is evidenced by the fact that Leslie G. Holleran, Deputy Chief Engineer of the Westchester County Park Commission, former President of the Chapter and Chairman of the Committee on Unemployment, has succeeded in securing employment for 75 men to tide them over this trying period of depression.

The matter of the unlawful diversion of funds, collected from gasoline and motor vehicle taxes, to purposes other than highway construction or maintenance was the subject of animated discussion. The Chapter has been keenly interested in this matter since the 1932 Winter Meeting of the State Society in Albany when a resolution relative to it was proposed by the Chapter and adopted by the State Society. The Chapter decided to supplement the action taken by the New York State Construction Council, Inc., in urging all legislative candidates to oppose any changes in existing laws which purpose to divert from highway uses any part of the revenues derived from such taxes and approved of the sending of questionnaires to legislative nominees to determine their position on this matter which so vitally affects the public works program of the State.

The Chapter has selected certain unemployed members to solicit new memberships on the financial basis approved by the State Board of Directors and is also continuing its activities to prevent the improper use of the designation "engineer."

Westchester County Chapter is among the most effectively active Chapters of New York. Enjoying admirable leadership under the present presidency of Harold W. Watt, and under the past presidency of Leslie G. Holleran, it has achieved success upon success in advancing toward those ideals toward which the New York State Society is progressing.

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## BRONX COUNTY

Bronx County Chapter's first meeting of the season was held at the Concourse Plaza Hotel on September 1st and was presided over by Prof. Alexander Haring, President of the Chapter. Hon. Leonard C. L. Smith, Engineer member of the Dept. of Sanitation of the City of New York was the guest of honor at the dinner-meeting of the Executive Board and at the Chapter meeting where he delivered a highly interesting address on the magnitude of the problems involved in the removal of the wastes of a city of 7,000,000 inhabitants and the vast extent of the projected facilities which will be necessary for the purification of the waters in and tributary to New York Harbor.

The Chapter formally approved of participation by the combined Chapters of New York City in the deliberations of the Citizens Budget Commission and authorized the payment of the Chapter's proportionate share of the necessary membership fee.

The guest speaker at the Chapter meeting held on October 6th was Herman Rappolt, M. E., who delivered a lecture on the "Pulp and Paper Industry" illustrated by standard size motion pictures. The lecture was highly instructive and interesting and the motion pictures were of unusual size and excellence for a presentation of this character.

Leo J. Ehrhart, President of the Bronx Board of Trade, and a member of the Bronx County Chapter, has been elected by the Board of Directors of the Citizens Budget Commission as a member of the Board of Trustees of that Commission.

The Citizens Budget Commission is undertaking to make an investigation of the municipal governmental structure,—of the reinforcement which will be required for its greater stability, of the extensions necessary for greater service, of the adoption and introduction of the most modern approved devices for its most economical support and operation. It is an undertaking in which engineers should play an important role and it is gratifying that a member of this Society —one of the most outstanding professional and civic figures in his community—should be invited to contribute his thought and service toward its success.

Anthony D'Angelo, a member of Bronx County Chapter, who recently passed a Bar Examination, has associated himself with the firm of Grant and McNaught, Counsellors-at-Law, in Oneonta, Otsego County. Mr. D'Angelo was a member of the Topographical Division of the Engineering Bureau under the jurisdiction of the President of the Borough of The Bronx and has acquired special knowledge in condemnation proceedings in connection with the acquisition of private property for public use. He has been an active and valuable member of Bronx County Chapter.

* * *

## NEW YORK CITY

On September 27th representatives of the five (5) Chapters within the City of New York met at the New York State Society of Headquarters to discuss the advisability of applying for membership in the Citizens Budget Commission. It was decided to make such application and the representatives organized themselves into a committee to be known as the "Citizens Budget Commission Committee of the New York State Society of Professional Engineers" under the chairmanship of Charles W. Burke, President of Kings County Chapter.

Mr. Fred H. Zurmuhlen, Jr., President of Richmond County Chapter, was unanimously chosen to represent the Society upon the Commission. It is anticipated with reason that he will be appointed to serve on the "Council of Consultants" which acts as an advisory committee to the Commission.

RAPHAEL J. SMYTH
Chairman, Committee on
Chapter Activities.


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## Robert Ridgway Retires

(Continued from Page 10)

labor. But who gave a thought to Ridgway? To most New Yorkers, although they come and go on the subways he built, even his name is unknown. For nearly half a century he worked in a glorious obscurity, holding himself aloof from politics and permitting no political interference in performing tasks which, in the opinion of General Goethals, were as formidable as any that had to be overcome at Panama.

"Whatever the recent inquiries of Judge Seabury may have revealed about the uses to which public offices and funds have been put, the city can at least ride in its new subway with the consciousness that the engineering staff of which Mr. Ridgway was the head lived up to the high standards of its profession, concerned only with building a transportation system designed to meet the needs of a hurried and dense population. It is no small thing to say of a New York official, charged as Mr. Ridgway was with the spending of nearly a billion dollars, that through him the city got its money's worth. He set an example of technical skill, conscientiousness and objectivity that revive belief in the ultimate efficiency of municipal government. The Board of Transportation is to be commended for having seen to it that a man who, despite his years, might engage in private practice, has been retained as a consultant."

Mr. Ridgway, who has reached the age of seventy, was born in Brooklyn in 1862. He has been identified with the public service of the City of New York for practically all, except the early years, of his professional career. His ability and accomplishments have been recognized throughout the world and although not a college trained man, various universities have made him an alumnus, and at Harvard he was chosen president of the alumni of its Scientific School.

Two great engineering projects of the City of New York which are unequalled in magnitude viz.,—the Water Supply and the Transportation Systems,—owe much to Mr. Ridgway, whose contributions brought him fame outside the confines of his native State. He has been retained in many parts of this country and abroad as a consultant on rapid transit, water problems, tunneling and other engineering projects.

He has been recognized and honored by many organizations and in 1925 he was chosen President of the American Society of Civil Engineers.

Possesed of an unusual memory Mr. Ridgway probably knows personally more engineers than any living man. He is not alone respected for his accomplishments and his fairness but is really beloved because of his uniformly courteous consideration for all with whom he has come into contact or whom he has directed as a superior officer. He is truly one of Nature's noblemen.

The American Engineer wishes Mr. Ridgway many happy returns and earnestly hopes that his influence will remain a potent factor in the profession which he has so long dignified.

## THE STATE OFFENDS

### Failure to Require License a Violation

Amongst the examinations held November 12th under the supervision of the Department of Civil Service of the State of New York was one for a position as Senior Civil Engineer. The requirements as set forth in the official advertisements were as follows:

SENIOR CIVIL ENGINEER (Mineral Water), Saratoga Springs Commission. Salary $2400 to $3000. One immediate appointment expected at $2400. The duties of the position include acting as assistant to the Superintendent of the State Reservation, overseeing detail work in connection with the operation and repairs of bath houses, bottling plants, pumping plants, mineral wells, parks, roads and buildings; handling purchasing of supplies, materials and equipment; supervising all field and office work along engineering, mechanical and technical lines. Candidates must be graduates of a college or university of recognized standing and have received a degree in engineering or must have had equivalent education. They must have had either two years or more of satisfactory business experience, at least one year of which shall have been in the purchasing of equipment and supplies and the hiring of laborers, or else they must have had not less than one year of satisfactory business experience combined with one or more years of experience in the installation or operation of mechanical systems for storage, conveying, heating or bottling of liquids and gases, preferably mineral water. In addition thereto they must have had not less than four years of diversified engineering experience (including preparation of plans, surveying, lay-out for construction, supervision of construction, estimating quantities and costs, maintenance and repair of equipment and structures) and, either included in this experience or in other engineering experience, not less than four years in a supervisory position above the grade of inspector. Subjects of examination: Written examination, relative weight 4; training, experience and general qualifications, relative weight 6.

Surely this is a flagrant disregard of the law regulating the practice of professional engineering. If the duties of the position or the qualities of a candidate warranted special consideration the title of the position and the requirements should be stated in such a manner as not to openly conflict with the law.

Any person qualifying and not possessed of a license is unquestionably liable under the provisions of the Practice Act.

# New Jersey News

## PASSAIC COUNTY

The Passaic County Chapter held its second Fall meeting on October 27th, 1932 at the Elks Club, Howe Avenue and Garden Street, Passaic, New Jersey, at 8:30 p. m.

The meeting was preceded by a dinner at 6:30 p. m., which was very informal and sociable. It is hoped that more of the members will come out to these dinners.

Captain John A. Brady, Captain of the Fourth Precinct, City of Newark Police, delivered an address on "Handling the Radical in Times of Unrest." The Captain described the organization and activities of the Communistic groups fostered in this country by the Soviet Union of Russia and outlined the problem they present to the police of our Metrolopitan Cities. Police Chief Murphy of Paterson, who was present as a guest, entered the discussion following the address, and presented additional information. Those in attendance were acorded an exceptional opportunity to hear authentic information by two of the best informed police officials in the State and the members not present certainly missed something.

The third meeting was held in the Public Service Electric Building, Prospect and Van Houten Streets, Paterson, N. J., on November 17th and was addressed by Mr. L. W. Whitcraft, Vice President of the Portland Cement Association, who spoke on the "Reconstruction Finance Corporation."

## Professionai Incomes

(Continued from Page 9)

COMMENT:

The above should be read carefully in order to appreciate the import of the tabulation. In one respect there is at least much justification for a difference of opinion. The author gives the impression that the need for doctors will grow faster than that for engineers. This hardly seems justified. A little reflection upon our civilization and the developments in the fields of sanitation, electricity, and chemistry appear to warrant quite a contrary opinion. There will be far greater need for engineers in future society than there has been in the past. Finally, one important factor has been overlooked by the professor, viz., the influence of legislation enlarging the field of mandatory control by engineers and a greater restriction upon the practice of the profession due to the unusually high standards of qualification demanded by law as a safeguard for society.

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## The Machine: Slave or Monster?

(Continued from Page 4)

of nobility. Tenacity, self-sacrifice, flashes of genius, disinterestedness—and where is the bounary between the spiritual and the material value of a great invention?

Nor has human daring been dampened by the advent of the machine and by the general spread of material comfort. On the contrary man seems to have acquired an even greater contempt for danger. Perhaps the highest expression of modern mechanical achievement wedded to the greatest examples of daring is afforded by the airplane which flies the Atlantic, whether it be the lone-eagle flight of Lindbergh, or the team flight of Balbo.

How can we suppose, however, that material comfort, the achievements of science, and even the splendid daring of Man, unless they be allied to spiritual nobility, may be sufficient to build up a really great and enduring civilization, capable of attaining the summits of philosophy and art? Idealism is no mere luxury or unserviceable encumbrance. The greatest civilizations have been those on which intellectual and moral light shed by the great philosophers and contemplative spirits has shone.

In all fairness it may be questioned whether this civilization of ours, based upon steam and electricity, is not going to submerge and obscure the finer and more distinctive characteristics and qualities of Man. This danger exists more especially for us business men because every hour of our daily life is so absorbing and interesting, because there are so many claims on time and attention. The daily newspaper and the radio wake us in the morning and pursue us throughout the day; our life is one perpetual hustle; the contacts with our fellows as we travel to our work, and then throughout the day in factory or office, in our associations in clubs and sports, all accentuate its external trend.

We must react against this. As material life inevitably gains in uniformity we must make an even greater effort to preserve and develop our intellectual individuality. The assortment of talents and the infinite shades of intellectual and spiritual pigmentation represent some of the finest values and greatest joys of life. We must find time to stop and interview ourselves; we must learn to appreciate silence and solitude, the beauties of poetry, the joys of culture, the fascination of mystery and legend.

Two contrasting dangers arise from the rapid development of applied science: the learned turn inevitably too over-specialization, the multitude to superficiality.

With the ever-greater subdivision into specialties are we not coming to the age when mental blinders will deprive many men of all-wide vision and create a sort of new Tower of Babel in which the confusion will not be that of tongues but of specialized capacities, mentalities, and terminologies?

On the other hand, automobiles and radio, movies and phonographs, and the many other devices of our day for increasing contacts and popularizing knowledge have suddenly brought masses of people up against masses of activities once entirely outside their ken.

The Hollywood star teaches manners and dress to the provincial girl the world over. The movies provide the public with conventional romance; the hero, the heroine, the villain, and the comic man being but exaggerated specimens of stereotyped platitudes.

The plain farmer's mind has suddenly had to become receptive to all sorts of information—stock exchange news, politics, sports, arts, etc. In the same way, tourists rush about seeing endless things, "doing" Rome, Athens, Tokio, or Timbuctoo, often without getting below the surface, without penetrating into the meaning of things.

The pessimist wants to know how the American *mater familias* can keep track of what her young boy and her young daughter read in the newspapers, see at the movies, and hear over the radio, and what company they seek when they drive off in the personally-owned car.

As a contrast to all this, we are led to recall the moral sanity of the mountaineers or the fishermen, accustomed to long silences, face to face with the sublime spectacles of nature, and who have the practiced eye and the natural sagacity of the simple.

Are not they the happiest?

This question has never yet received an answer.

We must live in our own age, and nothing today can stop the advance of mechanical civilization, a civilization impregnated through and through with the spirit of modern dynamic power. The East is taking it from the West; and Communism is taking it from Capitalism.

What matters is that the spread of material comfort should not be achieved through a deterioration of spiritual standards. Material comfort is a legitimate and even a meritorious goal to pursue, but the purpose should be to create an environment in which spiritual forces, the leaven of all lasting progress and of all the noblest satisfactions, will have full scope.

Undoubtedly if we try to evaluate the ultimate results of the new technological civilization, where its development has been most pronounced, we may rightly believe that the balance between the new material prosperity and intellectual factors has not been attained, but this need not alarm or discourage us. Life, whether individual or social, is ever in a state of flux, of unstable equilibrium. The path of progress is irregular; sometimes it is tradition which protects the flame of spiritual life and sometimes it is a revolution which rekindles the flame that careless guardians had let die down. We need not fear.

History teaches that glorious periods of spiritual and artistic vitality have been cradled by periods of material prosperity. "Primum vivere, deinde philosophari." As a matter of fact, philosophers came after conquerors; philanthropist and protectors of art were "sons of merchants."

We are already far removed from the days when scientific materialism, based more especially on the discoveries of chemistry, led Berthelot to exclaim "There is no more mystery." Man has come to see that life cannot be reduced to a mere chemical formula, and that each mystery ended gives rise to a hundred fascinating new ones.

Let us strive to secure the benefits of organization in the material field without sacrificing the glories of individuality in the spiritual field. Let us seek to harmonize our exterior and inner life, for that harmony will yield joy and benefit to all.

Let us strive that for ever larger multitudes the spiritual problem should be no mere opiate to dull suffering, but should be the joy reserved for those no longer unduly harassed by material anxieties.

Let us strive in order that the leading classes be ever more firmly convinced that intellectual and moral forces are those which advance our civilization, that machines are always a means and never an end in themselves.

The great Mediterranean civilization was the product of intercourse carried on over the highway of an inland sea, with Tyre, Athens, Carthage, Rome, Jerusalem, Alexandria, all contributing their highest attainments. Today the sea is the ocean, but it is easier for Man to cross oceans today than it was for him to traverse that sea of old. What vaster possibilities for our civilization if our spiritual development can keep pace with our opportunities!

Comment: The author of the above article, rubber grower and tire and cable manufacturer, is a distinguished Italian industrialist. He is managing-director of Pirelli Company of Italy, and lives in Milan where he is a member of the Rotary Club. His interests have carried him far outside Italian frontiers, however, and he has been active in post-war financial adjustments, having assisted in organization of the International Settlement Bank. At one time he was president of the International Chamber of Commerce. His address at the sixth congress of that body at Washington, from which his present contribution is drawn, is notable for its reasoned optimism in modern mechanical civilization.

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## Economic Regulation

(Continued from Page 6)

collected from him. With this scheme the fluctuation of the business cycle cannot be as severe as with our present method of letting things take their own course. The reduction of taxation would be reflected back to both the business man and the employe, relieving the one of some of his financial worries and giving the other a reduction of living cost and at the same time giving the employer less of a reason for wage reduction.

The above presupposes an intelligent effort of the average citizen to work toward good government by giving a little of himself toward government and by backing up to the limit public officials who are trying their best for the public welfare. After all, government is nothing more than a co-operative scheme, and Mr. Average Citizen, being a part to the scheme, must work to its success by doing his share."

Comment: The above is indicative of the engineer's ability to at least reason in accordance with the fundamental principles which are axiomatic in pure logic as well as in mathematics.

* * *

## Examination Questions

(Continued from Page 8)

14 The armature of a shunt motor has a resistance of 0.20 ohm. When the motor operates at full load on a 120-volt circuit, the armature current is 15 amperes. What is the counter e. m. f. of the motor under these conditions? What must be the resistance of the starting box to limit the starting current to 1.25 times its full-load value?

15 A voltmeter consisting of a 20-ohm coil and a 15,000-ohm series resistance produces full-scale deflection when 150 volts are applied across its terminals. Show how to modify this instrument for use as an ammeter which will give full-scale deflection for a line current of 50 amperes.

16 A camera has a lens of 6 inches focal length. How much must the lens be moved after focusing on an object 30 feet distant in order to focus on an object 6 feet distant?

* * *

## What Is Technocracy?

(Continued from Page 7)

attempted. Technocracy has its foundations in an extension of physics conceived shortly after the World War, when production in every line was speeded up to unprecedented heights and toward a goal where all manpower could be released for war service. It was evident to a few engineers at that time that the type of high-powered equipment which they were installing would be far-reaching in its effect on our social structure, and that the successful operation of this equipment would require a new type of social control which would be endemic to the nature of the equipment that was being placed in use. They saw with mathematical clarity that up until 1830, our rate of using energy in production had not really passed the speed of an ox-cart but that we were then in the process of attaining the speed of the airplane. While the mathematics of the theory of Energy Determinents is more complex than that of Einstein's unified field theory, the practical social implications are not difficult to grasp.

We must realize, Technocracy tells us, that we have reached the end of an era, that the fundamental cause of the depression is not political, it is technological. On this fact is predicated the necessity of appreciating that the only solution to our difficulties is a new era of technology where man can master the gigantic machine which has brought us to the close of the most fantastic period in the history of our small world. It is not a matter of choice. The old omnibus in which we have been riding has been patched up until its use as a vehicle is almost over. Technocracy is doubtful that it is even good for another parade. Our present system, it tells us, is fit only for the same museum in which are housed the pathetically inadequate political and economic theories of Plato, Marx and the great host of other diagnosticians and prophets who could not conceive of such a highly industrialized society as that in which we find ourselves today and Facism, Communism and Socialism are likewise wholly inadequate to cope with our problem.

Is an era passing? Read this pungent conclusion reached by Technocracy:

"The social system on this continent is being forced into a revision and revaluation of all its standards of value. The standards of the price system have been found wanting and an entirely new set of standards must be erected in order to deal with the physical conditions that have arrived by virtue of this hodgepodge created by the impact of technology on an old and outmoded social technique. America is witnessing the passing of the price system of production. We are faced with the problem of having to desert a system that has become obsolete and at the same time of designing a system to take its place."

What is a price system? By a price system we mean any social system having its means of exchange, and hence its control of industrial production, founded on a commodity valuation. As the engineers have stated it, "When in the process of social evolution all goods come to be evaluated in terms of some one commodity, be it wheat, wampum, dogs' teeth, paper or gold, the amount of this commodity exchangeable for one unit of any other commodity is said to be the price of the latter. Any social system using such a basis of exchange we shall call the price system."

No social state of history has operated on other than a price system, present day Russia being no exception.

It must be remembered that all modern industry has been operating under this ancient price system, and that if it operates successfully it must make a monetary profit. But if industry is to make a profit under conditions of competition and the continuous development of improved processes, it must continually cut down the costs of production and it has been found that the best way of reducing these internal costs of production is by means of large scale quantity output with processes as automatic as can be devised. Thus, under the price system, the requirement to cut internal costs to the minimum results in increasing mechanization and a tendency toward ever-decreasing man hours of employment. Take the manufacturing of cigarettes. Machines were recently installed which produce from 2,500 to 2,600 cigarettes a minute, compared with the previous maximum of 500 to 600 cigarettes a minute. Obviously, the tobacco company using these new machines cuts production costs markedly, but the important factor is that it permanently eliminates employment. A still more fantastic illustration is in incandescent lamp manufacture, where one man is doing today in one hour as much as it took him 9,000 hours to do only so short a time past as 1914. It required only a force of thirty-seven men six weeks to build this high-speed machine.

Technological advancement in the past twelve years has definitely shattered all old social theory, from that of the ancient Greeks through Karl Marx up to Veblen. It is unfortunate that most of our present economists are still floundering around with theories that have become mere folk lore in the last decade. Practically all of this social theory made two assumptions, both of which are now invalid in our dynamic state of energy conversion. The first was that the desires of the citizens of any social mechanism are unlimited, and hence expansion of production to meet these wants can be pushed to infinity. The second assumption was that human labor was a necessary factor in the production of wealth, and therefore the greater the number of men at work the more wealth tends to increase.

But Technology has advanced to the point where a relatively small number of high speed machines can supply all of the wants of a great number of persons and easily tends to over-production. The second assumption appears ridiculous when it is realized that man hours per unit of product and the labor cost per unit have dropped in recent years to levels approaching zero! So it is that our photograph of a modern steel rolling mill in operation shows the plant without a human being on the floor. There are many examples of large plants that could run continuously were the demand sufficient, with only a few operators at the controls. And yet some of our demagogues are still talking about "returning to normalcy" and putting our unemployed back to work in factories.

What has happened is simply that we have moved at a terrific pace through the age of hand-operated machines into the age of the technological mechanism. The machine of two decades ago was a hand-tool extension which aided man in doing his work, but with man as the operator. The technological mechanism entirely displaces man—does all the work for him—with one or more men at the controls of an entire plant. Forty years ago it was an occasion for boasting when a new machine was installed

which saved unpleasant human labor. Now there isn't even room for more than half of our 14 million unemployed if our factories were all running at 1929 production—a production rate which, fortunately, does not exist or we would be so deluged with goods in a short time that our confusion would be all the greater. Add to this the fact that a large proportion of our factory equipment is obsolete, ready to be scrapped for something more *efficient!* We have the spectacle of widespread efforts being made to put men to work where there isn't work to be done and where machines are infinitely more efficient. Has no one thought of letting the machines do man's work, and letting him rest on the labors of his mechanical slave?

If you want to know how far we have gone technologically, bear in mind that one hundred men in modern plants working steadily could produce all the bricks the country needs. Fit this case to other industries and you can get a glimpse of where we are today. In pig iron production, one man working one hour can do what it took him 650 hours to accomplish fifty years ago. In agriculture one man can do in one hour what it required 3,000 hours for him to accomplish in 1840. A still more striking example is a Milwaukee plant with its daily output capacity of 10,000 automobile chassis frames and 34 miles of pipe line with a total of 208 men in the plant. One man riding in the control cab can do all of the loading of freight cars which are shunted up to the siding of this factory.

Machines have been used by man since before 1800, but technological mechanisms—the advanced application of engineering to the machine—are less than two decades old. The machine displaced handicraft, but technology has displaced hand-operated machines with one, two or three automatic machines to the single industrial plant. Our first automatic plant arrived in 1915, and since then the advance in efficiency in every line has been so rapid that we haven't realized, or begun to realize, our extremely serious predicament.

We have been doing a lot of talking about "mastering the machine" but the bare truth in the matter of doing work is that the machine has man licked so long as he attempts to operate it under the present methods of price. In the light of these facts it seems apparent that only a radical change of immense proportions can pull us out of the mire.

The Theory of Energy Determinents underlying Technocracy which takes account of this acceleration of energy production (intensification of the efficiency of the machine) was enunciated by Howard Scott, engineer and technician for the Muscle Shoals Project, who has been directing the research work of the body. There were in the original group of Technocracy, formed about 1920, such outstanding figures as the late Charles P. Steinmetz, electrical wizard; Bassett Jones, electrical engineer; the late Thorstein Veblen, rebel economist; Frederick Lee Ackerman, architect; and Dr. Richard Tolman, of California Institute of Technology.

For the past year and a half the research work has been maintained by private funds and subscriptions, many of which have come from the Architects' Emergency Committee of New York. Thirty-six engineers have been steadily at work during this period. The work is centered in the engineering laboratories of Columbia University, where Technocracy is the guest of Professor Walter Rautenshauch's department of industrial engineering and of Dr. Nicholas Murray Butler.

This article to be concluded in the December issue.

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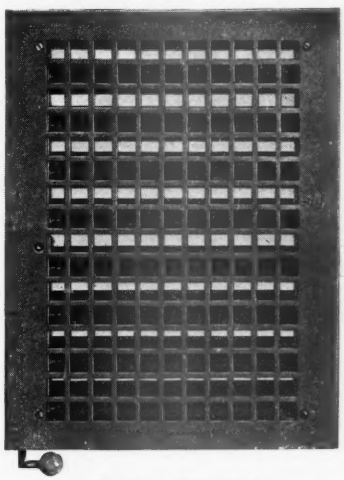

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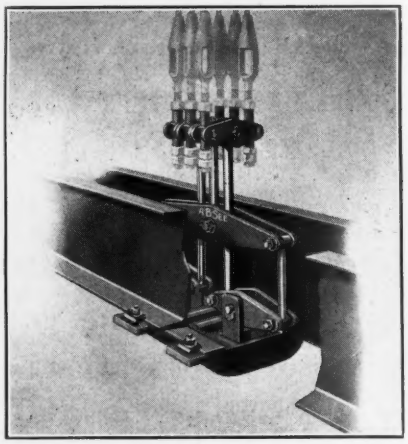

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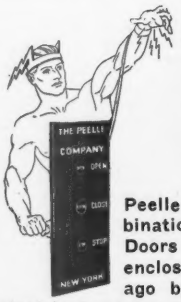


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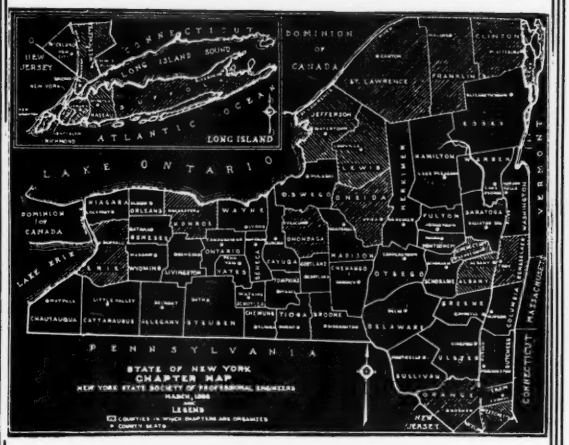


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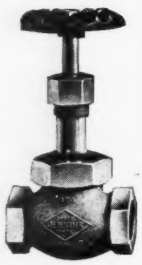

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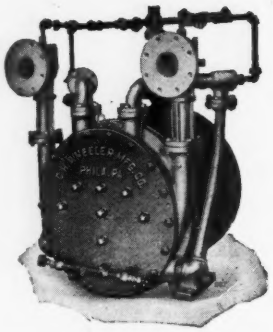

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